

really has its obvious and simple meaning of "reeking with sacrifice." Virgil was, however, misled, and paraphrases the passage in the *Odyssey* (*Aeneid*, I, 416) with his usual amplification into: "centumque Sabaeo; ture calent aerae." But it is evident that this was not accepted at the time. The elder Pliny more than once discusses the question and asserts emphatically "Iliacis temporibus . . . nec ture supplicabatur" (*N. H.*, I, 1, 1). Whatever, therefore, may have been the development in later times, the Homeric altar of Aphrodite at Paphos could not have been an incense-altar. It is true that it has been contended that sacrifices of blood were not offered to Aphrodite. But this is not sustainable. Victims were offered to the Paphian Venus in the time of Horace.

W. T. THISELTON-DYER.

The Electromotive Force of Standard Cells.

At the International Conference on Electrical Units and Standards, held in London in October, 1908, it was decided that the electromotive force of the Weston normal cell should be taken provisionally as 1.0184 international volts at 20° C. until further measurements, made under the auspices of the International Scientific Committee on Electrical Units and Standards, should enable a more accurate value to be assigned.

Measurements of a high degree of accuracy have now been completed, and show that the Weston normal cell made according to approved specifications has an electromotive force of 1.0183 international volts at 20° C., i.e. 1 part in 10,000 less than the provisional value assigned in 1908.

In consequence, the International Committee has passed a resolution expressing the desire that from January 1, and until a further recommendation, electrical standardisation in the standardising laboratories of all countries should be based on the value of 1.0183 international volts for the electromotive force of the Weston normal cell at 20° C.

Accordingly, all standard cells tested at the National Physical Laboratory will be compared with Weston normal cells of which the electromotive forces have been determined by direct measurement to be 1.0183 international volts at 20° C. These latter cells, together with new ones, will from time to time be remeasured in terms of the international ohm and the international ampere in order to ensure a constant standard of voltage.

It was assumed in the National Physical Laboratory certificates for 1909 and 1910 that the electromotive force of the Weston normal cell was 1.0184 international volts at 20° C., and therefore these certificates may be corrected for the change now introduced by subtracting 1 part in 10,000 of the value stated on the certificate.

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The National Physical Laboratory, January 1.

Klaatsch's Theory of the Descent of Man.

THERE appeared in NATURE of December 15, 1910, p. 206, a letter from Prof. Keith on Klaatsch's theory of the descent of man. As this letter is likely to give great discredit to the work of Klaatsch, in this country at least, I find myself, as a pupil of Klaatsch, justified in saying a few words more about it.

Klaatsch gives an account of his theory in a paper, entitled "Die Aurignac-Kasse und ihre Stellung im Stammbaum der Menschheit," in the *Zeitschr. f. Ethnologie*, 1910, Heft 3 and 4. After a short description of the skeleton of the Aurignac man, described by O. Hauser and himself in detail before, and after some general remarks about morphological methods in comparing the fossil man with anthropoid apes, Klaatsch goes on to consider in some detail the comparative anatomy of the humerus, ulna, and radius, and the skeleton of the hind limb of Aurignac and Neanderthal man, orang-utan, and gorilla. As Prof. Keith in his letter says that this basis is "flimsy in the extreme," we may very well examine it again. In the skull, the resemblance between Neanderthal man and gorilla (called the N.G. group), on one hand, and the Aurignac man and orang (called the A.-O. group) on the other, is hardly visible at all, only in the supraorbital ridges there are still some traces of it. But the resemblances are

very well marked in the skeleton of the limbs, especially of the arms. A superficial glance will show that the bones of A.-O. are slender, whilst those of the N.-G. are "clumsy." But this is no basis for exact scientific research; the important point is that there are differences in morphological details. The caput humeri, which articulates with the scapula, has a greater longitudinal diameter in A.-O. and a greater transversal diameter in N.-G. There is a sulcus intertubercularis between two ridges for the insertion of muscles. This runs straight down in A.-O., whilst it is somewhat S-shaped in N.-G. At the distal end, N.-G. shows a much greater mesial epicondyle, so that there results a sort of incision (incisura supracondyloidea, Kl.). In A.-O. the contour of the bone is much straighter; there is no sharp corner at all.

Very interesting differences are found at the proximal end of the ulna, but as this especially is a point where very detailed descriptions and technical terms are necessary, I shall pass at once to the radius. The shaft of that bone—the same holds good in both groups for the ulna—is almost straight in A.-O., but is distinctly bent in N.-G., so that the proximal and distal parts stand to each other in a well-marked angle. In the lower limbs the differences are not so well marked, although there, too, they exist. Differences are observed in the position of the trochanter major and minor, in the formation of the posterior intertrochanteric lines, in the angle between the collum (neck) and the shaft of the femur, in the shape of the malleolus and of the caput of the tibia, and so on. But they are not so striking as in the upper limb. This is quite clear, because the hind-limbs in man are highly specialised for the purpose of supporting the body, so that the influence of function is here much stronger than it is in the arms, which are free, and not always submitted to the same mechanical influences. So the differences are more hidden. But they can be seen by everyone who takes the care of studying the bones thoroughly.

I hope that even this short glance at the facts will have shown to the reader that there are two distinct groups of fossil man, the Aurignac man and the Neanderthal man, the Aurignac man resembling in many points the orang, the Neanderthal man resembling the gorilla.

In the first part of his paper Klaatsch only gives these "rather dry morphological facts." In the second part he proceeds to offer an explanation of these facts. As there is a close resemblance in morphological details of the Neanderthal race and the gorilla, and of the Aurignac race and the orang, he thinks that there must be a real blood-relation between the respective races. Klaatsch's idea, then, as to the descent of man is this. There was, originally, one group of primates, "propithecanthropoi," which, according to Klaatsch, resembled man more closely than any other now living primate. These gave origin, among others, to one group, out of which sprang the Neanderthal race and the gorilla. The Neanderthal man followed an upwards line in his development, the gorilla sank back, having become specialised in one direction, and by this being unfit for higher development. Klaatsch regards the gorilla and the other man-like apes as "failed experiments of man" (misslungene Versuche zur definitiven Menschwerdung).

In much the same way there sprang up another group, which developed into the Aurignac race and into the orang. So "the Aurignac man did not spring up from the Orang, just as the Neanderthal man did not spring up from the Gorilla" (p. 568, *loc. cit.*). How these two races of mankind reached Europe, Klaatsch tries to show in a sort of scheme, which has been published in NATURE already (November 24, 1910). The Neanderthal race came via Africa and Gibraltar, whilst the Aurignac race came via Asia.

Further on, Klaatsch thinks it possible that there are races who are related in the same way to the chimpanzee and to the gibbon. Other suggestions Prof. Klaatsch makes about the existing races and the other prehistoric races. According to him, the Galley Hill and "Brünn I" skull belong almost certainly to the Aurignac race, very likely also Chancelade and Engis! As to the existing races, Klaatsch thinks to have found a relation of negroes to the Neanderthal race. Otherwise his suggestions are very hypothetical, and only meant as a working hypothesis, so that it is no good now to consider them closely.

We first have to examine the theory itself thoroughly, and then draw the conclusions.

Now, when Prof. Keith states that Klaatsch speaks about a descent of man *via* the gorilla or *via* the orang, this is wrong, as I hope to have made clear by the quotations of Klaatsch's paper. But when Prof. Keith speaks about "convergence phenomena," to which has to be ascribed a great deal, he no doubt touches the point most exposed to criticism. It is, indeed, very difficult to believe in two races, so much one like the other as man is to man, and yet so unlike in some minute morphological detail, as Aurignac is to Neanderthal, without supposing that they once were very much more unlike, and that they afterwards got more alike again by convergence. But this difficulty of Klaatsch's theory must never make us forget the facts. The problem is this. There are two distinct "races" each possessing distinct morphological characters, the one resembling the orang in these characters, the other the gorilla. How can these differences and likenesses be explained? It is certainly a very difficult problem, but a very interesting one too, that is well worthy to receive serious consideration. In any case, we must be grateful to Klaatsch for having directed attention to this fact, and for offering us an explanation—even if the latter should be only a preliminary one.

GERHARDT V. BONIN.

Breslau, January 28.

WHILE admiring the manner in which Herr Bonin states the case for his Professor, I do not think he has produced any evidence that requires me to alter my statement that Prof. Klaatsch's latest theory of the origin of human races is founded on a "flimsy" basis. To understand the nature of Prof. Klaatsch's "pan-anthropoid" theory of the origin of human races, it is necessary to know the circumstances which led him to formulate it. He found that the recently discovered Quaternary individual, which he has dignified with the name of *Homo aurignacensis hauseri*—quite a modern type of man—followed closely in point of time the individual he described in 1908 as *H. moustieriensis hauseri*—a man of the Neanderthal type. To account for the manner in which these two quickly succeeding types differ, Prof. Klaatsch propounded the "theory" that the Aurignac man is descended from the orang stock, while the Neanderthal has arisen in the gorilla line of descent. Now the characters which separate those two types are exactly of the same nature and of the same degree as separate a blood-horse from a Shire stallion. Every one of the points cited to differentiate these two types of men are dependent on the degree of muscular development. Bones, especially limb bones, react sensitively to the muscles which move them; muscular impressions and processes for the insertion of muscles vary from individual to individual, and from their nature are most untrustworthy for the purpose of tracing affinities.

There is thus, in my opinion, no need to have recourse to such a theory as Prof. Klaatsch has formulated to explain the contrasted characters of the Aurignac and Neanderthal types of men; the problem is of the same nature as meets us when we seek to explain contrasted breeds among dogs and horses. Further, from a study of acromegaly, that most interesting disease of growth which I have had opportunities of examining of late, it is quite apparent that an alteration in the action of the glands of internal secretion—especially of the pituitary—will change in the course of a few years a man of the Aurignac type into one of the Neanderthal type—not an exact replica, but near enough to leave no doubt that the characters of acromegalics and of Neanderthal men are of the same nature.

Prof. Klaatsch also realised that if his theory were applicable to two races of men, it should hold true for all. Hence his suggestion that some may have arisen from the chimpanzee and some from the gibbon. His theory—a "pan-anthropoid" theory—of the origin of human races is designed to account for the various features which characterise and differentiate human races.

To those acquainted with the great mass of evidence which has accumulated in recent years relating to the structure, development, and habits of living and extinct anthropoids, Prof. Klaatsch's theory must appear altogether untenable. From 1890 to 1900 I devoted myself to an investigation of the Higher Primates, making com-

plete dissections of more than eighty animals, and collected all descriptions which had been published at the close of that period, with the intention of tracing, from the mass of facts thus collected, the evolutionary history, not only of man, but of each of the anthropoids. An extensive analysis was made of the structural characters of each of these animal forms. Characters are found in them which also occur in lemurs, in South American monkeys, in old-world monkeys. Some characters are common to all the members of the Higher Primates (man, gorilla, chimpanzee, orang, and gibbon); others which are common to the Giant Primates (man, gorilla, chimpanzee, and orang); others which are found only in man, the gorilla, and chimpanzee; and then a considerable number which are peculiar to each member, and may be regarded as late acquisitions.

The characters I relied on were not such as Prof. Klaatsch has used—the highly variable muscular impressions on bones—they were points such as, I believe, most anatomists would regard as of morphological worth. Publication of my results was suspended owing to several circumstances; and I do not regret the fact, because since then much additional evidence has been discovered, such as the affinities shown by blood tests and by susceptibility to disease, and much of an anatomical and physiological nature, which I hope to gather and systematise. Meantime, I merely state briefly the results reached more than ten years ago. Whatever theory is propounded of the origin of the several members of the Higher Primates must account for their structural and functional characters. It is certain that Prof. Klaatsch's theory is altogether inapplicable for their explanation.

Table giving an Analysis of the Structural Characters of the Higher Primates.

Nature and Character	A Man	B Gorilla	C Chimpanzee	D Orang	E Gibbon
Peculiar to the genus (generic characters)	312	75	109	113	116
Common to A, B, C...	93	93	93	—	—
" B, C, ...	—	78	78	—	—
" A and C, ...	98	—	93	—	—
" A and B, ...	87	87	—	—	—
" A, B, C, D	112	130	133	130	—
" A and D, ...	56	—	—	56	—
" C and D, ...	—	—	65	65	—
" B and D, ...	—	78	—	78	—
A, B, C,	—	—	—	—	—
D, E, ...	93	132	132	132	133
Common to E and A, B, C, or D, ...	84	56	93	74	—
Common to Old World Monkeys and A, B, C, D, or E, ...	53	144	172	213	323
Common to New World Monkeys and A, B, C, D, or E, ...	60	33	32	38	76
Lemuroid Characters.	17	41	37	50	50
	1065	1004	980	949	1002

The manner in which I seek to explain the distribution of these characters is the following. The gibbon is regarded as the representative of the basal stock of the Higher Primates, and this Hylobatian stock is looked upon as an offshoot of a basal stock (late Eocene probably), which also gave rise to the Old and New World monkeys. The distribution of characters of these groups is thus explained in the modern representatives of the Higher Primates. The evolution of the Hylobatian form marks the first and most important stage in that process which led to man's upright posture. The body of the gibbon shows all the adaptations for an upright posture (perhaps downright would be a better term) in which the weight is more suspended from the arms than supported by the legs.

The next stage in the evolution of the Higher Primates is clearly the appearance of a form which, compared to all that had gone before, may be regarded as a "giant" stock. There can be no doubt the Giant Primates (man, gorilla, chimpanzee, and orang) arose from the Hylobatian stock, and that *Dryopithecus* (a Miocene form) is a very good example of an early Giant Primate. The first stage in the evolution of the Higher Primates is the acquisition of a new posture, the second the acquisition of a new stature. The orang does not possess a number of characters which are held in common by man, the gorilla, and chimpanzee, and I therefore suppose that the orang